

WHAT IS CLAIMED IS:

1. An infrared (IR) sensor, comprising:
a sensor array comprising multiple IR sensors, for collecting IR energy from an external scene; and
a sensitivity adjuster associated with said sensor array, for adjusting a pixel grouping to provide a required image sensitivity.
2. An IR sensor in accordance with claim 1, wherein said sensor array comprises a two dimensional arrangement of said IR sensors.
3. An IR sensor in accordance with claim 1, wherein said sensor array comprises an array of photon detectors.
4. An IR sensor in accordance with claim 3, wherein said photon detectors comprise photoconductive sensors.
5. An IR sensor in accordance with claim 3, wherein said photon detectors comprise photovoltaic sensors.
6. An IR sensor in accordance with claim 1, wherein said sensor array comprises an infrared focal plane assembly (IRFPA).
7. An IR sensor in accordance with claim 1, further comprising a readout element associated with said sensor array, for performing periodic sensor array readout.
8. An IR sensor in accordance with claim 1, wherein said sensitivity adjuster comprises a window selector for selecting a readout window within said array.

9. An IR sensor in accordance with claim 1, wherein said sensitivity adjuster comprises a grouping factor selector for selecting a pixel grouping factor during IR energy collection.

10. An IR sensor in accordance with claim 7, said readout element having a readout time variable with a size of a selected readout window.

11. An IR sensor in accordance with claim 7, wherein said readout element comprises an integrate while read (IWR) device.

12. An IR sensor in accordance with claim 7, wherein said readout element comprises an integrate then read (ITR) device.

13. An IR sensor in accordance with claim 1, wherein said adjusting is in accordance with externally provided control information.

14. An IR sensor in accordance with claim 1, further comprising an image processor, for processing a sensor array output signal so as to form a feedback signal for controlling said adjusting.

15. An IR sensor in accordance with claim 7, further comprising an image processor, for processing a readout signal so as to form a feedback signal for controlling said adjusting.

16. An IR sensor in accordance with claim 14, wherein said image processor further comprises an SNR detector for detecting an SNR of said image signal.

17. An IR sensor in accordance with claim 16, wherein said detected SNR comprises an average SNR.

18. An IR sensor in accordance with claim 16, wherein said detected SNR comprises a maximum SNR.

19. An IR sensor in accordance with claim 16, wherein said detected SNR comprises a minimum SNR.

20. An IR sensor in accordance with claim 14, wherein said image processor further comprises a contrast detector, for detecting a contrast level of said image signal.

21. An IR sensor in accordance with claim 20, wherein said contrast level comprises an average contrast level.

22. An IR sensor in accordance with claim 20, wherein said contrast level comprises a maximum contrast level.

23. An IR sensor in accordance with claim 20, wherein said contrast level comprises a minimum contrast level.

24. An IR sensor in accordance with claim 1, further comprising an exposure time calculator for selecting a sensor exposure time.

25. An IR sensor in accordance with claim 24, wherein said selecting is in accordance with external scene total radiation.

26. An IR sensor in accordance with claim 24, wherein said exposure time calculator is operable to maintain an average collected charge of said sensor at a specified level.

27. An IR sensor in accordance with claim 24, wherein said selecting is in accordance with previously obtained sensor exposure levels.

28. An IR sensor in accordance with claim 7, further comprising an averager for averaging respective IR sensor levels over multiple readout cycles.

29. An IR sensor in accordance with claim 28, wherein a number of said averaged cycles comprises a maximum integer number of sensor exposure and readout cycles included in a single video frame time.

30. An IR sensor in accordance with claim 1, further comprising an optical portion for focusing external IR radiation upon said sensor array

31. An IR sensor in accordance with claim 1, said sensitivity adjuster comprises a mode selector for switching between a high-sensitivity operating mode and a low-sensitivity operating mode.

32. An IR sensor in accordance with claim 14, further comprising a mode selector for switching between a high-sensitivity operating mode and a low-sensitivity operating mode in accordance with said feedback signal.

33. An IR sensor in accordance with claim 8, further comprising a mode selector for switching between a small readout region and a large readout region, respectively to provide high-sensitivity and low-sensitivity imaging.

34. An IR sensor in accordance with claim 9, further comprising a mode selector for switching between a large pixel grouping and a small pixel grouping, respectively to provide high-sensitivity and low-sensitivity imaging.

35. An IR camera comprising:
a sensor array comprising multiple IR sensors, for collecting IR energy from an external scene;
a sensitivity adjuster associated with said sensor array, for adjusting a pixel grouping to provide a required image sensitivity;
and
a video processor, for processing a sensor array output to form a video image.

36. An IR camera comprising according to claim 35, further comprising an optical portion for focusing external IR radiation upon said sensor array

37. An IR camera comprising according to claim 35, further comprising a readout element associated with said sensor array, for performing periodic sensor array readout.

38. An IR camera comprising according to claim 35, wherein said sensitivity adjuster comprises a window selector for selecting a readout window within said array.

39. An IR camera comprising according to claim 35, wherein said sensitivity adjuster comprises a grouping factor selector for selecting a pixel grouping factor during IR energy collection.

40. An IR camera comprising according to claim 35, further comprising an image processor for processing said image signal so as to form a feedback signal for controlling said adjusting.

41. An IR camera comprising according to claim 40, wherein said feedback signal comprises at least one of: average image SNR, maximum image SNR, minimum image SNR, average image contrast, maximum image contrast, and minimum image contrast.

42. An IR camera comprising according to claim 35, further comprising a mode selector for switching between a high-sensitivity operating mode and a low-sensitivity operating mode.

43. An IR camera comprising according to claim 35, wherein said IR camera comprises a FLIR device.

44. An IR camera comprising according to claim 35, further comprising an image analyzer, for analyzing said video image to identify specified properties of interest.

45. An IR camera comprising according to claim 44, wherein said IR camera comprises a surveillance device.

46. An IR camera comprising according to claim 44, wherein said IR camera comprises a targeting device.

47. An IR camera according to claim 35, further comprising a head up display (HUD).

48. An IR camera according to claim 47, wherein said IR camera comprises an aircraft visibility enhancer.

49. A method for IR sensing, comprising:
adjusting a pixel grouping of a sensor array to provide a required image sensitivity; and
collecting IR energy from an external scene with said sensor array in accordance with said pixel grouping.

50. A method in accordance with claim 49, further comprising selecting a sensor exposure time.

51. A method in accordance with claim 49, wherein said selecting is to maintain an average collected charge of said sensor at a specified level.

52. A method in accordance with claim 50, wherein said method is performed repetitively at a maximum rate permitted by said pixel grouping and said selected exposure time.

53. A method in accordance with claim 50, wherein said selecting is in accordance with previously obtained sensor exposure levels.

54. A method in accordance with claim 49, further comprising performing periodic sensor readout.

55. A method in accordance with claim 49, wherein said adjusting comprises selecting a readout window within said array.

56. A method in accordance with claim 49, wherein said adjusting comprises a selecting a grouping factor.

57. A method in accordance with claim 55, wherein said adjusting comprises a selecting a grouping factor.

58. A method in accordance with claim 54, further comprising forming a feedback signal for controlling said adjusting from said sensor readout.

59. A method in accordance with claim 58, wherein said feedback signal comprises at least one of: average image SNR, maximum image SNR, minimum image SNR, average image contrast, maximum image contrast, and minimum image contrast.

60. A method in accordance with claim 54, further comprising averaging respective sensor levels over multiple readout cycles.

61. A method in accordance with claim 49, further comprising switching between a high-sensitivity operating mode and a low-sensitivity operating mode.

62. A method in accordance with claim 49, further comprising analyzing said video IR image to identify specified properties of interest.

AMENDED CLAIMS

**[Received by the International Bureau on 17 February 2005 (17.02.05) ;
original claims 1, 35, 44-46, 49, 51 and 62 amended ;claims 63 and 64 are new ;
remaining claims unchanged]**

1. An infrared sensor comprising:
a sensor array comprising multiple IR sensors, for collecting IR energy from an external scene; and
a sensitivity adjuster associated with said sensor array, for adjusting between a field of view, and a grouping of sensing pixels to derive a required image sensitivity.
2. An IR sensor in accordance with claim 1, wherein said sensor array comprises a two dimensional arrangement of said IR sensors.
3. An IR sensor in accordance with claim 1, wherein said sensor array comprises an array of photon detectors.
4. An IR sensor in accordance with claim 3, wherein said photon detectors comprise photoconductive sensors.
5. An IR sensor in accordance with claim 3, wherein said photon detectors comprise photovoltaic sensors.
6. An IR sensor in accordance with claim 1, wherein said sensor array comprises an infrared focal plane assembly (IRFPA).
7. An IR sensor in accordance with claim 1, further comprising a readout element associated with said sensor array, for performing periodic sensor array readout.
8. An IR sensor in accordance with claim 1, wherein said sensitivity adjuster comprises a window selector for selecting a readout window within said array.
9. An IR sensor in accordance with claim 1, wherein said sensitivity adjuster comprises a grouping factor selector for selecting a pixel grouping factor during IR energy collection.

10. An IR sensor in accordance with claim 7, said readout element having a readout time variable with a size of a selected readout window.
11. An IR sensor in accordance with claim 7, wherein said readout element comprises an integrate while read (IWR) device.
12. An IR sensor in accordance with claim 7, wherein said readout element comprises an integrate then read (ITR) device.
13. An IR sensor in accordance with claim 1, wherein said adjusting is in accordance with externally provided control information.
14. An IR sensor in accordance with claim 1, further comprising an image processor, for processing a sensor array output signal so as to form a feedback signal for controlling said adjusting.
15. An IR sensor in accordance with claim 7, further comprising an image processor, for processing a readout signal so as to form a feedback signal for controlling said adjusting.
16. An IR sensor in accordance with claim 14, wherein said image processor further comprises an SNR detector for detecting an SNR of said image signal.
17. An IR sensor in accordance with claim 16, wherein said detected SNR comprises an average SNR.
18. An IR sensor in accordance with claim 16, wherein said detected SNR comprises a maximum SNR.
19. An IR sensor in accordance with claim 16, wherein said detected SNR comprises a minimum SNR.

20. An IR sensor in accordance with claim 14, wherein said image processor further comprises a contrast detector, for detecting a contrast level of said image signal.
21. An IR sensor in accordance with claim 20, wherein said contrast level comprises an average contrast level.
22. An IR sensor in accordance with claim 20, wherein said contrast level comprises a maximum contrast level.
23. An IR sensor in accordance with claim 20, wherein said contrast level comprises a minimum contrast level.
24. An IR sensor in accordance with claim 1, further comprising an exposure time calculator for selecting a sensor exposure time.
25. An IR sensor in accordance with claim 24, wherein said selecting is in accordance with external scene total radiation.
26. An IR sensor in accordance with claim 24, wherein said exposure time calculator is operable to maintain an average collected charge of said sensor at a specified level.
27. An IR sensor in accordance with claim 24, wherein said selecting is in accordance with previously obtained sensor exposure levels.
28. An IR sensor in accordance with claim 7, further comprising an averager for averaging respective IR sensor levels over multiple readout cycles.
29. An IR sensor in accordance with claim 28, wherein a number of said averaged cycles comprises a maximum integer number of sensor exposure and readout cycles included in a single video frame time.

30. An IR sensor in accordance with claim 1, further comprising an optical portion for focusing external IR radiation upon said sensor array.

31. An IR sensor in accordance with claim 1, said sensitivity adjuster comprises a mode selector for switching between a high-sensitivity operating mode and a low-sensitivity operating mode.

32. An IR sensor in accordance with claim 14, further comprising a mode selector for switching between a high-sensitivity operating mode and a low-sensitivity operating mode in accordance with said feedback signal.

33. An IR sensor in accordance with claim 8, further comprising a mode selector for switching between a small readout region and a large readout region, respectively to provide high-sensitivity and low-sensitivity imaging.

34. An IR sensor in accordance with claim 9, further comprising a mode selector for switching between a large pixel grouping and a small pixel grouping, respectively to provide high-sensitivity and low-sensitivity imaging.

35. An IR camera comprising:
a sensor array comprising multiple IR sensors, for collecting IR energy from an external scene;
a sensitivity adjuster associated with said sensor array, for adjusting between a field of view, and a grouping of sensing pixels to derive a required image sensitivity,
and
a video processor, for processing a sensor array output to form a video image.

36. An IR camera comprising according to claim 35, further comprising an optical portion for focusing external IR radiation upon said sensor array.

37. An IR camera comprising according to claim 35, further comprising a readout element associated with said sensor array, for performing periodic sensor array readout.

38. An IR camera comprising according to claim 35, wherein said sensitivity adjuster comprises a window selector for selecting a readout window within said array.
39. An IR camera comprising according to claim 35, wherein said sensitivity adjuster comprises a grouping factor selector for selecting a pixel grouping factor during IR energy collection.
40. An IR camera comprising according to claim 35, further comprising an image processor for processing said image signal so as to form a feedback signal for controlling said adjusting.
41. An IR camera comprising according to claim 40, wherein said feedback signal comprises at least one of: average image SNR, maximum image SNR, minimum image SNR, average image contrast, maximum image contrast, and minimum image contrast.
42. An IR camera comprising according to claim 35, further comprising a mode selector for switching between a high-sensitivity operating mode and a low-sensitivity operating mode.
43. An IR camera comprising according to claim 35, wherein said IR camera comprises a FLIR device.
44. An IR camera according to claim 35, further comprising an image analyzer, for analyzing said video image to identify specified properties of interest.
45. An IR camera according to claim 44, wherein said IR camera comprises a surveillance device.
46. An IR camera according to claim 44, wherein said IR camera comprises a targeting device.

47. An IR camera according to claim 35, further comprising a head up display (HUD).

48. An IR camera according to claim 47, wherein said IR camera comprises an aircraft visibility enhancer.

49. A method for IR sensing, comprising:
adjusting a pixel grouping of a sensor array to provide a required image sensitivity;
and
collecting IR energy over a variable window fromn external scene with said sensor array in accordance with said pixel grouping.

50. A method in accordance with claim 49, further comprising selecting a sensor exposure time.

51. A method in accordance with claim 50, wherein said selecting is to maintain an average collected charge of said sensor at a specified level.

52. A method in accordance with claim 50, wherein said method is performed repetitively at a maximum rate permitted by said pixel grouping and said selected exposure time.

53. A method in accordance with claim 50, wherein said selecting is in accordance with previously obtained sensor exposure levels.

54. A method in accordance with claim 49, further comprising performing periodic sensor readout.

55. A method in accordance with claim 49, wherein said adjusting comprises selecting a readout window within said array.

56. A method in accordance with claim 49, wherein said adjusting comprises a selecting a grouping factor.

57. A method in accordance with claim 55, wherein said adjusting comprises a selecting a grouping factor.

58. A method in accordance with claim 54, further comprising forming a feedback signal for controlling said adjusting from said sensor readout.

59. A method in accordance with claim 58, wherein said feedback signal comprises at least one of: average image SNR, maximum image SNR, minimum image SNR, average image contrast, maximum image contrast, and minimum image contrast.

60. A method in accordance with claim 54, further comprising averaging respective sensor levels over multiple readout cycles.

61. A method in accordance with claim 49, further comprising switching between a high-sensitivity operating mode and a low-sensitivity operating mode.

62. A method in accordance with claim 49, further comprising analyzing a video IR image to identify specified properties of interest.

63. An infrared sensor comprising:
a sensor array comprising multiple IR sensors, for collecting IR energy from an external scene; and
a field of view adjuster associated with said sensor array, for adjusting between a field of view and a grouping of sensing pixels to provide a required spatial resolution.

64. An infrared (IR) sensor, comprising:
a cryogenically cooled sensor array comprising multiple IR sensors, for collecting IR energy from an external scene; and

a sensitivity adjuster associated with said sensor array, for adjusting a pixel grouping to provide a required image sensitivity.